



**Description:** Learners discover, by playing a fun game, that the solar wind material collected during the Genesis mission is smaller than can be seen.

**Background:** The national science standards call for learners to know that different objects are made up of many different types of materials. In this activity, learners will first observe some objects and list some of the physical properties. Then, participants will use the sense of touch to try to distinguish two different objects. Older learners will model that materials may be composed of parts that are too small to be seen by pretending that they have super-magnifier eyes able to see a "wafer" material (rice) and "solar wind" (safety pins). In the Genesis spacecraft, the wafers are made out of different materials in order to analyze different elements and isotopes. All elements from atomic number 3 through 92 will be collected on all wafers.

## National Science Standards<sup>1</sup>

### K-2 Nature of Science

#### [Understands the nature of scientific inquiry](#)

Knows that learning can come from careful observations and simple experiments

### K-2 Physical Sciences

#### [Understands the structure and properties of matter](#)

Knows that different objects are made up of many different types of materials

### 3-5 Physical Sciences

#### [Understands the structure and properties of matter](#)

Knows that materials may be composed of parts that are too small to be seen without magnification

<sup>1</sup>Kendall, J.S. & Marzano, R.J. (2000). *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education*. (3rd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

## Materials (For each pair or small group)

- One bowl of uncooked rice (Do not use instant rice as it has a rough, easily detectable texture)
- Ten small safety pins (approximately 2 cm long)
- Blindfold
- Watch or clock (minute timer)
- Write-On Sheet, "[Invisible Fun](#)"

## Procedure:

1. Distribute materials to each pair or small group of two to four participants. Ask the learners to describe the properties of each of the materials. They may describe the color, size, and state of matter for the materials.

2. Explain that each person will take several turns trying to pick out the safety pins from the bowl of rice while blindfolded.
3. Have one person put the blindfold on and another keep time. The blindfolded person will have one minute to pick out as many safety pins as possible. Once this is done, record the results in a data table.
4. Learners should switch tasks and repeat the process.



5. Ask learners to write questions about the activity they just completed. (Some learners may ask why it was so difficult to pick out the safety pins from the rice; others may want to know why the rice and safety pins felt the same even though they had different properties.)
6. Refer to the pictures of the solar wind collector array and magnified wafer on page two of the Write-On Sheet. Explain to the learners that this activity modeled solar wind collection on the Genesis spacecraft. Questions 5 through 8 will help them to piece together an analogy between the two. It may also be helpful to further discuss and demonstrate the model. For example, the leader could explain:  
*If everyone had super-magnifier eyes, we could see the smallest parts that make up all matter (atoms). The rice represents the atoms of the material in the collector wafers and the safety pins represent the solar wind particles. Demonstrate a safety pin going into the bowl of rice. Tell learners that solar wind travels very fast and embeds into the wafers!*
7. Facilitate a post-activity discussion by asking such follow-up questions as:
  - Why were you blindfolded for this activity? (Learners may suggest that no one can see the solar wind particles because they are too small.)
  - How will scientists be able to study solar wind? (Learners may suggest special instruments such as high-power microscopes.) Tell participants about an instrument called the **mass spectrometer** which can examine the tiny particles, identify the chemicals or contents of the particles, and shows the results on a computer.
  - During this activity, if the material in the collector wafers is represented by rice, and particles of solar wind are represented by safety pins, then what do you think represents the mass spectrometer? (Learners may explain that since they could not rely on sight, their fingers, like a mass spectrometer, were used

to analyze the materials and determine which were solar wind particles or safety pins).

This activity was adapted for Community Quest from an activity in the Genesis education module *Dynamic Design: A Collection Process* found at:

<http://www.genesismission.org/educate/scimodule/CollProcess/index.html>

### **Resources for Extension and Enrichment Activities**

<http://set.lanl.gov/programs/LASSO/ACE/ACETchr/Albee/particleact.html>

"Super Particle Round Up" is a hands-on activity that models solar wind collection using Superballs and buckets.

<http://set.lanl.gov/programs/LASSO/ACE/ACETchr/Albee/particletrap.html>

"Particle Trap" provides another model of particle collection as learners experiment with different speeds to "trap" marbles in plastic tubing.